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Control methods of bee- eaters (*Merops spp.*) and their ecological hazards.

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Abstract *Merops* spp. is one of the important bee predators, so the beekeepers try to control it in different ways, some of the methods are physical that are non-lethal to the bird and are not harmful to the environment, and others are lethal or environmentally harmful. In this review, we discussed the most important physical and chemical methods used in this field, with an indication of some banned pesticides that are used by beekeepers, and an illustration of their environmental hazard

Key Words: *Merops* spp., bee eater, ecological hazards, insecticides, furdan.

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Introduction

Honeybees affected by many diseases and pests that effect on the activity of them, bee-eater is the most bird affecting on various activities of honeybees like foraging and pollen gathering also effect on mating queens (Omran *et al*., 2018).

There are three groups of predatory Bee-eater birds, the main predators which contain two families, Indicatoridae and Meropidae, the members of these families depends essentially on honey bee and bees wax as meal source(Ambrose, 1997), the Meropidae family contains three genera and twenty four species, the genus *Merops* is represents a serious danger to honey bees most species of this family a migrant birds and some of theme that immigrates between continents (Ambrose, 1997; Wongsiri *et al*., 2005).

The most famous genera of *Merops* are *Merops apiaster* and *Merops orientalis.*

The European Bee-eater *Merops apiaster* was regarded as sole species in the family Meropidae which breeds more in moderate temperature regions than tropical ones (Fry,1984) .

The Eurpean Bee-eater *Merops apiaster*, featuring by its richly colored, slender body, it has brown and yellow upper parts, whilst the wings are green and the beak is black, it can reach a length of 27– 29 cm, including the two elongated two feather (Krebs and Houston, 1988).

The bird is a widely distributed species although mainly are abundant in arid and semi-arid areas. The current area of the European Bee-eater expands from North Africa through the Iberian Peninsula, Southern Europe, the Carpathian Basin, Eastern Europe, Small and Mid-Asia to Kashmir due to postglacial dispersal (Cramp 1998, Snow and Perrins 1998). El-Bassiony, 2001 recorded that the highest population of bee-eaters were recorded during the period of May 6-12 and from August 15-21in the first and second active seasons, respectively.

Jones *et al*., 1994 proposed that bee-eater is one of the few bird species with the ability to modify the habitat by digging long burrows where it breeds, therefore fitting to the definition of the allogeneic engineer.

Valera *et al*., (2011) conclude that bee-eater mobility and migration may have played an important role in the transmission of the pathogen *N. ceranae*.

Ali and Ali (2012) conclude that bee-eaters cause losses of honeybee workers and affecting on queen rearing and should avoid queen mating at the periods of bee-eaters present.

Dabessa and Belay (2015) found that the major pests facing the beekeeping activities, farmers were requested to rank them, and the result indicated that bee-eater birds (67.46%), ants (66.67%), wax moth (39.68%), lizards (26.68), termites (18.25%) and hive beetles (13.49%) were the most harmful pests in order of decreasing importance.

The bee- eaters are gregarious-nesting colonially in sand banks, preferably near river shores, and inhabit a variety of habitat types such as forests, savanna, shrubland, grassland, and agricultural area. (Yosef *et al*., 2006)

The green bee-eater *Merops orientalis* is the most variable species in the family Meropidae and can be subdivided into six to eight geographically variable races. (Fry, 1984)

Sihag (1993) found was the green bee-eater, *M. orientalis*, to prey upon foraging honeybees A. *mellifera* in India.

Control methods:

1-physical methods

A- non-lethal methods

1- Set up the decoys of bee-eaters predatory species with sounds. companied by a device emitting repelling sounds of predatory species and alarms of different birds (Moreno-Opo et al., 2018).

2- Protection of the apiary with meshes, nets, and a water supply. A shaded mesh must be placed above all the hives of the apiary, supported by poles and tensioners, and at the lowest possible height above the hives. The shading mesh is complemented with plastic side nets to prevent the access of bee-eaters to the immediate proximity of the hives. Drinking troughs are placed among the hives so that bees had a water supply as close as possible to their hives (Moreno-Opo *et al*., 2018).

B- Lethal methods: (our field notices)

1- Use of hunting weapons and gunshots, Fig (1).

Hunting weapons are used to kill the bird and disturb it with bullets or air pressure, which generates a loud sound that often frightens the birds.

Figure 1: The weapon used to kill and expel the bee-eater bird

One of the advantages of this method is that it is effective in killing or expelling birds and keeping them away from the apiaries, whose presence may lead to exhaustion of the apiaries

and reduce the population density of bees inside the cells, and consequently the destruction of colonies. The bees do not leave their hives or reduce the bees flight if they hear birds flying over the apiaries or lurking on electrical wires or trees close to the apiary.

This method has drawbacks, despite its advantages, that the use of bullets makes loud sounds, which may affect the population living in the farms if the apiaries are in the farms, but if they are in residential areas, the matter is worse and more important, in addition to the loud sounds, the cost of the equipment used is high and expensive and there is no economic feasibility From its use, the numbers of gear are large as a result of the presence of birds in the form of flocks and that they rarely go and do not return, as one of the behaviors of this bird when it detects a group of insects and especially near the apiaries, it does not leave that area even if it moves away from it, it returns to it again.

2- The use of fishing nets

Many beekeepers used fishing nets of different sizes, with holes in diameters ranging from 4-5 inches, for the purpose of catching beards (Figure, 2). These nets were set up at different dimensions of the apiary, starting from 5 meters to 100 meters, and around the apiary, which are the dimensions that this bird maneuvers while attacking the bees leaving their cells.

The use of fishing nets helps to catch the bird while attacking the bees near the apiary, because of the thick swarms and the large numbers emerging from the apiary.

This makes the bird monitor the site of the apiary and monitor the exit of the bees and does not leave the place, but rather attaches close to the apiary and attacks the bees from time to time and in large numbers as it forms a swarm consisting of a group Birds attacking bees at one time, which works to catch large numbers of bees and thus affects the bee density of beehives and reduces the number of bees that play a major role for the hive by collecting food (nectar and pollen), water and propolis, Therefore, fishing nets and when a number of birds are caught while they attack the bees and the birds remain suspended in the nets work to keep the rest of the birds away and prevent the attack of bees near the apiaries or areas of netting.as illustrated in figure (3).

The disadvantages of using fishing nets are that when the bird falls into the fishing nets, the bees attack the bird while it is suspended in the nets, which leads to the loss of many bees of sting organ, and here there is a great loss in bees, as compared to the loss of bees caused by the bird because of feeding on bees.

Figure 2: Use of fishing nets to catch bee-eater birds

Figure 3: The bee attacking the bee-eater bird after it fell into the fishing net.

3- Using insecticides to kill bee- eater bird

Some beekeepers use a pesticide to kill the beekeeper, and two methods are used in this case: -

• **First method**

This is done by fogging a group of bees with a toxic substance (Laidiz) that does not affect the bees and releasing the bees that have been dusted at a distance from the apiary and the presence of a bird that captures some of these bees, which leads to poisoning the bird. It is clear and after its release by beekeepers and at a distance from the apiary and during the return of the males or bees covered with the pesticide to their hives, the bird attacks it and feeds on it.

Figure 4: Number of birds that were killed using a specialized pesticide (Laidiz).

This process also indirectly affects the offspring of these birds that are waiting for their mothers to fetch food. Either mothers will die because of poisoning before they reach their nests, or they reach the nests and start feeding their chicks, and thus the toxic substance will work to kill the chicks as well as killing their mothers. In this case, the control process will be It played a major role in the elimination of the bees and their chicks in the nests, which is reflected in their numbers that attack the bees near the apiaries.

Second method

The use of certain chemicals materials such as calcium cyanide, as the use of cyanide is used to eliminate nests of birds, which it

builds in burrows at the edges of hills and earthen heights and digs the dirt and builds its nest inside the burrow. As for combating it with cyanide, it is dangerous, as teams of trained people identify nesting places The birds, at dusk, and while the birds are still in their nests, put cyanide in the bird's hole and close the hole where the cyanide evaporates and generates a gas capable of killing the chicks.

The use of any kind of pesticides or chemicals inside the beehives is not without risk as a result of the possibility of contamination of bees or incomplete stages (open brood, larvae of different ages) or honey and pollen, which are the stored food for the colony with some chemical compounds that make up pesticides, which may need to For a long period of decomposition, the harm of these pesticides lies in their residues that may be long inside bee products, which may cause poisoning in the future to bees or to the consumer of bee products such as honey, royal food and pollen.

▪ bee-eater bird and lethal pesticides

A key aspect of pesticide is to kill the pests that attack the economic plant, increasing plant production. Another use of pesticide is to control the veterinary and medical insects, such as houseflies, cockroaches, and bed bugs (Al-Malah and Shaaban 1993) for health maintenance. This pesticide is subjected to the experts consulted by (plant protection Engineers). However, recently, the use of dangerous pesticide has been increased to control the Merops, where it is a large genus of bee-eaters, a group of near passerine birds in the family Meropidae (**https://en.wikipedia.org/wiki/Merops_(genus)**. This bird is controlled by using Carbofuran (Furdan). It is 2,2-Dimethyl-2,3-dihydro-1-benzofuran-7-yl methylcarbamate (Fig. 5), a carbamate insecticide, resulting in nerve system poisons. It is likely to be riskier to epidermal health. In the US, Furdan ranked as a mega danger.

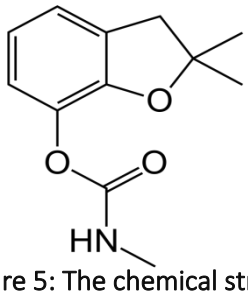

Figure 5: The chemical structure of Furdan.

Furdan is implicated to cause a high-toxicity level as a V-nerve agent. The median lethal dose via oral for rats is between 8-14, and for dogs is 19 $mg.kg^{-1}$ of body weight.

On the other hand, Furdan is considered extremely toxic for birds, when it is used as granules formulations. Where one granular can kill a bird. Therefore, this insecticide results in a high mortality for millions of birds yearly. Thus, it was banned to use by the Environmental Protection Agency (EPA) IN 1991. For human toxicity, one milliliter (equivalent ¼ spoon tea) can kill humans. The use of this insecticide is illegal in the United States (US), and the United Kingdom (UK). This pesticide was documented against pets, wild animals, especially Hawks and eagles.

Bans of Furdan use

Many countries around the world have banned Furdan use, for example, Canada, and the European Union, including the UK in May 2008. Meanwhile, the EPA has announced the prevention of the use of Furdan in the US. But it was continuously used on corn, potatoes, pumpkins, sunflowers and spinach grown for seed production. Later, it was stopped to be used on all crops, and plants used for human consumption in May 2009, considering this procedure resembles the actual banning.

Comment

Despite the damage cause by the bee eater to the bees but It has a key role in the environmental balance by limiting the spread of some insect pests that affect some crops.

In Iraq, Furdan is available and used illegally to save honeybee insects by uneducated people, causing the high level of Warwar mortalities. This procedure results in transferring the pesticide residues inside the incubators then the honey. Meantime, these residues will move into humans. In a sense, it is implicated to poisons people due to their transfer via the food chain. Finally, it will settle in people, hence some bodies can break down this residue owing to it possessing a strong healthy system, otherwise, the body is affected by these residues, resulting in a dangerous disease occurrence. This study highlights the coming future problem, which has huge effects on humans when there is no action taken. For instance, the monitoring of handling pesticides, and particularly the entering of pesticides into Iraq. We invite the responsible directorates to take suitable action to save the community from the chemicals risky that have highly toxicity.

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طرق مكافحة طائر الوروار *Merops spp.* ومخاطرها البيئية

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المستخلص

يعد طائر الوروار *Merops spp.* أحد مفترسات النحل المهمة والتي يعاني منها النحالين في مختلف البلدان التي يصلها هذا الطائر، ويستخدم مربي النحل مختلف الطرق الفيزيائية والكيميائية لطرد او قتل هذه الطيور.

بعض طرق مكافحة الطائر تعتبر غير مضرة للبيئة وغير قاتلة للطير نفسه وبعضها الاخر ذات أخطار بيئية تحتاج الى الكثير من المراقبة والتنظيم. في هذه المراجعة تم التطرق الى اهم الطرق المستخدمة في المكافحة مع الاشارة الى بعض المبيدات المحظورة والمستخدمة حاليا من قبل بعض النحالين وخصوصا في العراق، وتوضيح ضررها وأثرها البيئي.